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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,289	07/11/2003	David J. Hemker	LAM1P128/P0561	4379
22434	7590	01/25/2005		
BEYER WEAVER & THOMAS LLP P.O. BOX 70250 OAKLAND, CA 94612-0250			EXAMINER ANDERSON, MATTHEW A	
			ART UNIT 1765	PAPER NUMBER
DATE MAILED: 01/25/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/618,289

Applicant(s)

HEMKER ET AL.

Examiner

Matthew A. Anderson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-48 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-48 is/are rejected.
- 7) ☒ Claim(s) 11 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Claim Objections

1. Claim 11 is objected to because of the following informalities: The last line has a grammatical error and the examiner suggests adding the preposition "to" between "bonded and "the". Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 31-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lymberopoulos et al.(US 6,085,688) in view of Hills et al. (US 6,217,786 B1).

Lymberopoulos et al. discloses a method of and apparatus for producing a plasma for use in manufacturing microelectronics including dry (i.e. gas phase) etching of semiconductor wafers. The chamber shown in Fig 5 is azimuthally symmetric around the center. The chamber holds the plasma as it is ignited and during the processing of the wafer since there is no separate plasma generation chamber. A window is disclosed in column 6 lines 8-35. The Rf antenna (i.e. a coil is shown in Fig. 5 as 110) is disposed above the plane defined by the wafer (i.e. substrate). Electromagnets (150a

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and 150B in Fig. 5) are disposed above the wafer. The magnets are disclosed as independently controllable conductors in the abstract and are used to control the plasma density and prevent non-uniform charge build-ups. By magnetically controlling the uniformity of charge distribution, one of ordinary skill in the art would expect the uniformity of the etching to be controlled. This reads on the changing of the variation in the magnetic field to improve processing uniformity across the substrate. The wafer is placed in the chuck at the bottom of the reaction chamber and gas is flowed in to form a plasma. In col. 10 lines 1-8, the control of the plasma density throughout the chamber from the workpiece to the inductive window and antenna is suggested. The relationship of the magnetic fields to the plane of the substrate to be etched is shown in the Figs. including that numbered 11. Clearly the magnetic field need not be perpendicular to the substrate surface. In col. 7 lines 24-31 is described the control of the magnetic field to directly control the plasma density near the workpiece surface.

Lymberopoulos does not explicitly disclose dc power to the electromagnets but dc is a known power supply configuration. Lymberopoulos is silent as to the gas used in the etching process.

Hills et al. discloses etching a wafer and an oxide on that wafer using specified gases including fluorocarbons and inert carrier gases with Rf plasma (a dry etching process). The specific fluorocarbons of C_2F_6 , C_3F_8 and C_4F_8 or mixtures thereof were disclosed as were the carrier gases of Ar, He, Ne, Kr, Xe, or mixtures thereof. These read on the two or more gases of the form $C_xF_yH_zO_w$ as defined in the spec lines 19-21

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on page 30). Oxygen and nitrogen gases as well as the hydrogen-containing additive gases CH₄, H₂, H₂O, NH₃ were also optionally present.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to select dc power as a source of power in the method of Lymberopoulos et al. because DC was known in the art and was a conventional means of supplying power to electrical devices.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to select the etching gases disclosed by Hills et al. as useable in a Rf powered plasma processing chamber because Hills et al. discloses such gases as conventional for such operating environments.

In respect to claims 31, the reference fails to disclose controlling the magnetic field in the region proximate the antenna to improve the processing uniformity across the substrate. However, it would have been obvious to one of ordinary skill in the art at the time of the present invention to modify the reference of Lymberopoulos et al. to specifically include the step of controlling the magnetic field in the region proximate the antenna because said reference discloses such magnetic control in an etching process and such control would have been anticipated to produce an expected result of process uniformity.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to flow the claimed listed gases into such an Rf plasma processing chamber because these gases were known to Hills et al. for Rf processing and their use would have been anticipated to produce the expected result of dry plasma etching.

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4. Claims 36-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lymberopoulos et al. and Hills et al. as applied to claims 31-35 above, and further in view of Kondo (US 6,254,966).

Lymberopoulos et al. and Hills et al. are described above.

The references fail to disclose that the possible etching gases useable in a plasma etching process of amorphous silicon oxide include C_2HF_8 , C_2HF_5 , CHF_3 , $C_2H_2F_2$, $C_2H_2F_4$, CH_2F_2 , and mixtures including the same.

Kondo et al. discloses a supporter for recording mediums which is made of (see col. 17 lines 55+) glass (a.k.a. amorphous silicon dioxide). The etching of the supporter is performed by dry etching. Plasma is known to those of ordinary skill as a dry etching process since gases are used to form the excited species therein. The gases used to etch include CHF_3 , CF_4 , C_2F_6 , C_3F_8 , NF_3 , SF_6 , C_2F_4 , C_3F_6 , C_4C_8 , C_4F_{10} , C_5F_8 , C_6F_{14} , C_3F_6O , C_9F_{10} , CF_3Br , CF_3I , C_2F_5I , CF_2Cl_2 , $CFCl_3$, CH_2F_2 , C_2HF_5 , $C_2H_2F_4$, $C_2H_4F_2$, $C_2H_3F_3$, C_3HF_7 , CF_3 , $C_2H_2F_3$, $C_8H_3F_5$, Cl_2 , CCl_4 , $SiCl_4$, BCl_3 , PCl_3 , CCl_3F , BBr_3 , CH_2Cl_2 , and mixed gases thereof and other mixed gases containing oxygen, hydrogen, argon, He, N_2 , Ne, Ar, Kr, Xe, O_3 , CO, CO_2 , H_2O , CH_4 , C_2H_6 , C_3H_8 , C_4H_{10} , C_2H_4 , C_3H_6 , C_4H_8 , C_2H_2 , and C_3H_4 .

It would have been obvious to one of ordinary skill in the art at the time of the present invention to select the additional etching gases suggested by Kondo et al. and modify the Lymberopoulos et al. combined references because Kondo et al. discloses that the claimed gas species are used either alone or in combination to plasma (i.e. dry) etch silicon oxide in conventionally know processes.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the claimed listed gases in a plasma etching process because the claimed listed gases and mixtures thereof were known by Kondo et al. to be useful for plasma etching glass and their use in such an environment would have been anticipated to produce the expected result of glass (i.e. silicon oxide) etching.

5. Claims 42-45, 1-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lymberopoulos et al. combined as applied to claims 31-35 above, and further in view of Lu (EP 0821397 A2).

Lymberopoulos et al. does not specify the material used to manufacture the processing chamber.

Lu et al. discloses a composite SiC that is used to form the chamber wall, chamber roof, collar around the wafer, grounding plane, and window for Rf radiation in a chamber to be used for plasma processing (abstract). The SiC is described as useful for reducing flaking (page 6 lines 35+). The surface after etching was smooth. This suggests little interaction of the material and the plasma. And, as table 2 shows, the etch rate of the SiC was less than the commonly used quartz or Si. The SiC was described as made from a layer of CVD SiC composite bonded to a free standing SiC wall formed from such methods as sintering or hot pressing. The bulk wall was described as grounding in lines 40-45 on page 8.

In respect to claims 1-30, and 42-45, it would have been obvious to one of ordinary skill in the art at the time of the present invention to select a material (such as a composite SiC) that does not substantially react with the reactive gases flown into the

processing chamber as the material from which to form the processing chamber because such a SiC chamber is suggested by Lu et al. and because that material was not substantially reactive with Rf plasmas according to Lu et al. This beneficially reduces required maintenance in the apparatus.

In respect to claims 1-20, 27-30, 46-48, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form a processing chamber from a material such as a composite SiC/cvd-SiC (see above) which does not substantially react with the reactive plasma gases flown into the processing chamber, forms an electrical ground, has an Rf antenna, has a coupling window, has an electro-magnet configuration above the substrate, and has variable power for the electro-magnets because such a SiC chamber is suggested by Lu et al. in light of the Lymberopoulos et al. combinations detailed above. The examiner notes that Lu et al. reads on a chamber made entirely of SiC since Lu et al discloses walls roof and Rf coupling window made of SiC.

In respect to claims 21-26, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form a more electrically resistive substrate support (i.e. pedestal) than that found elsewhere in the chamber because Lu suggests such an insulating substrate support (see Page 8 lines 20-30 and Table 3).

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11

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F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 31-45 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 31-45 of copending Application No. 09/440,794. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims (31 in particular) of the present invention lack the limitation as to the non-perpendicularity of the magnetic field in an axial direction to the substrate surface in at least one radial region. The claims are identical in all other aspects.

8. A person of ordinary skill in the art would have concluded that the invention defined in the claims at issue was an obvious variation of the invention defined in the copending application because the copending application claims are more specific as to how the magnetic field used to control the plasma (and thus the etching uniformity) is arrayed in the chamber. The present claims are not so limited and reasonably include the copending claims because some form of magnetic control (and therefor, magnetic field) is required for the execution of the claim process.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (571) 272-1459. The examiner can normally be reached on M-F, 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MAA
January 6, 2005

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER

